Amendments to the Drawings:

FIGs 2 and 3 have been revised as indicated on the attached pages.

REMARKS

I. Status of Claims

Claims 1-14 are pending in this application. By this Amendment, claims 4-7, 11, and 13 have been amended. Reconsideration is respectfully requested in view of the above amendments and the following remarks.

II. Rejection

A. Drawings

The Office Action objects to the drawings for failure to show claimed features. Accordingly, the drawings and claims have been revised and amended respectively to ensure that each claimed feature is shown. Specifically, Figures 2 and 3 have been revised. In Fig.2, applicants have enclosed relay in a box and labeled the box as 61. Alternatively, as shown in dotted lines, the box 63 may include FET semiconductor elements. Since the inclusion of these components is thoroughly supported by the original application, no new matter has been added. In FIG. 3, applicants have shown the alternative in which spring/anti-twist device 25 extends between the support ring and the housing as defined in the claims and specification. Thus, no new matter has been added. The remaining drawings show the spring element disposed between the bearing and the housing. Accordingly, all features of claims 5, 7, and 13 are shown in the drawings. With respect to claim 6, this claim has been amended to eliminate the reference to a plate spring.

Accordingly the drawings show all claimed features and withdrawal of the objection is respectfully requested.

B. Claim Objections

The Office Action objects to claims 4, 5-7, 11, and 13 for various informalities. This objection is respectfully traversed. The claims, although clear and definite in their original form, have been amended in an effort to comply with the Examiner's request.

Specifically, claim 4 has been amended to comply with the Examiner's suggested language. With respect to claims 5-7, 11, and 13, applicants respectfully submit that the language "one of x and y" is a clear, definite, and is one of the generally preferred techniques for reciting claim elements in the alternative. See MPEP, 2173.05(h). However, applicants are unconcerned with the precise language preferred in this instance as long as the meaning of the

claims is clear. Accordingly, the claims have been revised to use "or" to recite claim elements in the alternative as suggested in the Office Action. Applicants respectfully submit that the claims are clear and definite and withdrawal of the objection is respectfully requested.

C. Rejections under 35 U.S.C. § 112

Claims 5-7, 11, and 13 have been rejected under 35 U.S.C. § 112. This rejection is respectfully traversed. As set forth above, applicants have amended claims 5-7, 11, and 13 to comply with the Examiner's suggestions. Thus, applicants respectfully submit that all of claims 5-7, 11, and 13 are clear and definite. Withdrawal of the rejection is therefore respectfully requested.

D. Rejections under 35 U.S.C. § 103

Claims 1-11 and 14 have been rejected under 35 U.S.C. §103 over U.S. Patent No. 6,550,567 to Murikami et al. (hereinafter "Murikami") in view of "Geometry and Design of Involute Spur Gears with Asymmetric Teeth", by Alexander Kapelevich (hereinafter "Kapelevich") . This rejection is respectfully traversed.

The Office Action asserts that Murakami discloses a worm gear including the claimed features with the exception of a worm wheel that has teeth including different pressure angles on the right and left so that the normal force between the worm and worm wheel is independent of the direction of rotation of a torque exerted on said worm by said worm wheel. The Office action further asserts that Kapelevich teaches a gear having teeth with different pressure angles that accomplish the claimed objective.

However, even if combined, Murakami and Kapelevich would not have resulted in the claimed invention. Kapelevich teaches particular considerations related to the use of asymmetrical teeth on **spur** gears. Kapelevich fails to make any mention of the use of asymmetrical teeth on a **worm** gear. The calculations provided in Kapelevich are inapplicable to the worm gear structure. Kapelevich has no more applicability to the claimed invention than any other reference that teaches the use of asymmetrical teeth for a non-analogous gear. Neither reference suggests, teaches, or discloses the use of teeth having two different pressure angles for a worm gear.

Claim 1 of the present application requires a worm gear for a vehicle steering system. The worm gear comprises a shaft swivably mounted for swiveling in the radial direction. The worm and worm wheel are preloaded in the radial direction. The worm wheel has teeth, each said tooth having

right and left tooth flanks which are inclined at respective pressure angles, the pressure angle of the right tooth flank and the pressure angle of the left tooth flank being different from each other so that the normal force between said worm and said worm wheel is independent of the direction of rotation of a torque exerted on said worm by said worm wheel.

As illustrated in FIG. 1 of the instant application and as explained in the specification, when the angles are equal, the self-inhibition of the worm gear is dependent on the direction of rotation. In other words, whether the worm gear will rotate when the electric motor is switched off depends upon the direction of rotation of the worm gear. This effect is undesirable when the worm gear is used in a steering system. The strategic choice of different angles allows the worm gear to behave independently of the angle of rotation.

Kapelevich fails to teach any technique for selecting different angles so that the normal force between said worm and said worm wheel is independent of the direction of rotation of a torque exerted on said worm by said worm wheel as required by independent claim 1. Neither Kapelevich nor Murikami provides a teaching that would allow one skilled in the art to arrive at the invention of claim 1.

Furthermore, no motivation would have been present for modifying Murakami with the disclosure of Kapelevich. Kapelevich teaches that asymmetric teeth are desirable in the design of involute spur gears. Kapelevich concludes that the proposed tooth configuration allows for an increase in load capacity while reducing weight and dimensions. Spur gears have straight teeth and are mounted on parallel shafts. Spur gears are not typically used in automobile components because spur gears generate loud noises when the teeth collide. Furthermore, because of their structure, spur gears must be considerably larger than worm gears to achieve the same reduction ratio and therefore reduction of gear size is important for spur gears, but is not generally an objective for worm gears.

In a worm gear configuration, the drive axes of the worm and worm-wheel are at 90 degrees to one another. With a single start worm, for each 360 degree turn of the worm, the worm wheel advances by only one tooth. Therefore, regardless of size, the gear ratio of the worm gear is "the number of teeth":1. For example, with a single start worm, a twenty tooth worm gear will reduce the speed by the ratio of 20:1.

With spur gears, a gear having twelve teeth would have to be matched with a 240 tooth gear to achieve the same ratio of 20:1. Thus, in terms of physical size, the worm arrangement

will be considerably smaller in volume than the spur arrangement.

Another distinction between worm gears and other types of gears is that the direction of transmission of a worm gear is not reversible due to the greater friction involved between the worm and worm wheel. This feature provides an advantage if it is necessary to eliminate the possibility of the output driving the input.

The distinctions between the types of gears and the entirely different problems encountered with the types of gears renders any teaching regarding the configuration of asymmetric teeth present in Kapelevich likely to be inapplicable to Murikami.

Accordingly, applicants respectfully submit that the invention of claim 1 is nonobvious both because the combination of both references lacks the claimed features and because no motivation would have existed to combine the references as suggested in the Office Action. Claims 2-11 and 14 incorporate the features of claim 1 and therefore define over the art of record for at least the reasons set forth above with respect to claim 1. Withdrawal of the rejection is therefore respectfully requested.

Claims 12 and 13 have been rejected under 35 U.S.C. § 103 over Murikami in view of Kapelevich and in further view of U.S. Patent No. 6,046,560 to Lu et al. (hereinafter "Lu"). Lu fails to obviate the above-noted deficiencies of Murikami and Kapelevich. Accordingly, claims 12 and 13 define over the art of record for at least the reasons set forth above with respect to claim 1. Withdrawal of the rejection is therefore respectfully requested.

E. Double Patenting

Claims 1-11 and 14 have been rejected on the grounds of non-statutory obviousness-type double patenting over claims 1-20 of U.S. Patent No. 6,860,829 to Bock et al. in view of Kapelevich. This rejection is respectfully traversed. Bock et al. disclose a worm gear configuration. Kapelevich teaches the use of asymmetrical teeth for spur gears. As set forth above, Kapelevich fails to teach, disclose, or suggest the configuration of asymmetrical teeth necessary to render the normal force between said worm and said worm wheel independent of the direction of rotation of a torque exerted on said worm by said worm wheel. Thus, the present claims are not drawn to the same invention as the Bock patent and furthermore are not obvious over the claims of the Bock patent. Accordingly, the double patenting rejection cannot be sustained. Withdrawal of the rejection is therefore respectfully requested.

III. Conclusion

In the event Applicants have overlooked the need for an extension of time, payment of fee, or additional payment of fee, Applicants hereby petition therefore and authorize that any charges be made to Deposit Account No. 02-0385, Baker & Daniels.

Should the Examiner have any questions regarding any of the above, the Examiner is respectfully requested to telephone the undersigned at 202-589-2899.

Respectfully submitted,

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Encs. - Replacement Drawing Sheets
Annotated Drawing Sheets

Annotated Sheet

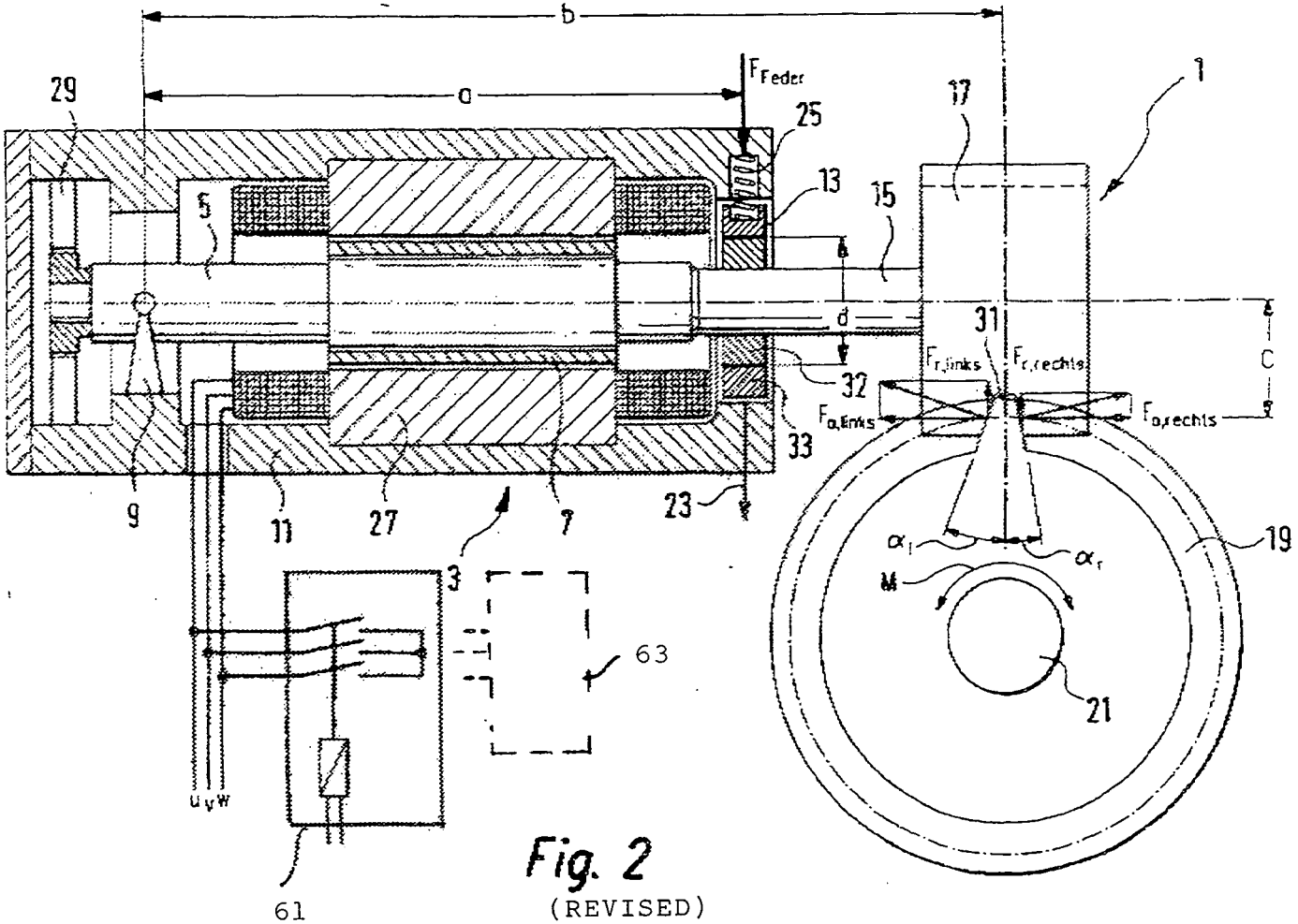

Fig. 2
(REVISED)

Annotated Sheet

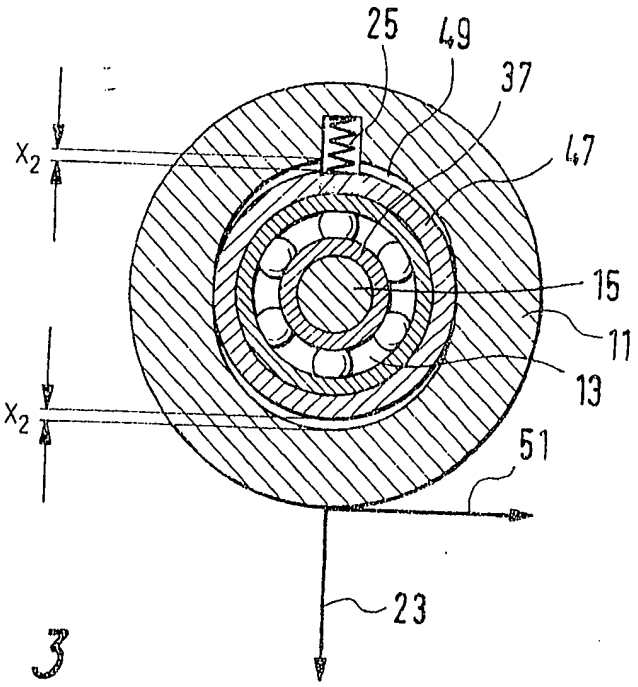

Fig. 3

(REVISED) Shortened Spring 25

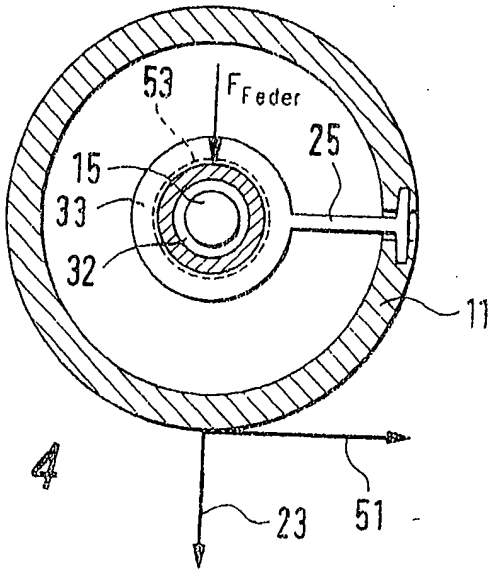

Fig. 4